

REMARKS**Status of the Claims**

Claims 18, 28, 29, 38 and 50-85 have been previously cancelled.

Claims 1, 3, 4, 7-17, 19, 21, 22, 24, 30-34, 40-42, 44, 46, 49, 86, 87, 93, 102 and 103 have been amended are currently amended.

New claims 104-129 have been added.

Claims 1-17, 19-27, 30-37 and 39-49 and 86-129 are pending.

Response is made to the Office Action dated October 24, 2002. Applicants gratefully acknowledge the allowance of claim 102 and the indication in the Office Action that claims 4-17, 22-27, 30, 41, 42, 45, 47, 48, 91, 92, 99-101 and 103 would be allowable if rewritten in independent form incorporating the limitations of the base claims from which they depend and any intervening claims. Consideration of the following remarks and allowance of the pending claims is respectfully requested.

Rejection Under 35 USC § 102(b)

Claims 1-3, 19-21, 31, 32, 34-37, 39, 40, 43, 44, 46, 49, 86-90 and 93-98 stand rejected under 35 USC § 102(a) as being anticipated by U.S. Patent No. 5,437,331 (*Gupta et al.*). It is stated in the Office Action that *Gupta et al.* teach a fluid used for fracturing a subterranean formation that comprises a polymer viscosifier and an encapsulated breaker which may contain an enzyme. The Examiner also takes the position that *Gupta et al.* teach (at col. 5, lines 15-20) that the enzyme may be released by pressure, diffusion or volatilization. The Examiner suggests that even diffusion would qualify as anticipating Applicants' claims. According to the Examiner, the term "normal conditions" is considered to be insufficiently defined, and it is said that Applicants have not defined what abnormal conditions encompass so as to distinguish from the prior art. Regarding claim 46, the Examiner suggests that the polymer becomes a contaminant prior to cleanup.

Applicants respectfully traverse the rejection based on *Gupta et al.* for at least the reason that it improperly equates "time release" with "triggered release." The "encapsulated" breaker taught by *Gupta et al.* would be utilized to continuously release breaker to the system. The release of the enzyme is controlled by temperature, pressure, volatilization and diffusion. Those four

conditions refer to the time release, *i.e.* the rate of release of enzyme, not to the triggering event that initiates release the enzyme. It is clearly the intention in *Gupta et al.* that the "encapsulated" enzymes will begin their release when mixed with the fluid and placed into the normal conditions of temperature and pressure existing during fluid use in the reservoir. The specific exclusion of membranously encapsulated enzymes (col. 4, lines 5-11) reinforces this concept of a particle that continuously releases breaker under the normal conditions of fluid use. Indeed, because the *Gupta et al.* reference speaks only of an open-pored particle of cross linked-polymer, it would appear that the descriptor "capsule" (*i.e.* a "small casing or envelope") is inapt in the context of the invention disclosed by *Gupta et al.*

By contrast, the presently claimed methods encompass use of a particle, containing a degrading agent (*e.g.*, an enzyme or other breaker), that does not release the agent when exposed to the initial conditions (*e.g.*, typical downhole conditions of temperature and pressure existing during fluid use in the reservoir). While *Gupta et al.* mention the possibility of an "encapsulated" enzyme with zero activity at time zero, it appears that temperature actually controls the release rate.

All examples in the *Gupta et al.* reference show a pattern of reduced breaking action of "encapsulated" enzyme with time, *i.e.* the slower rate of breaking action in systems containing "encapsulated" enzyme due to the nature of the disclosed particle. Indeed, one might argue that the data presented are indistinguishable from a simple reduction in initial enzyme concentration, and so do not support the claim of "controlled release," which is generally accepted to mean the continuous release over time of until-then-unavailable material to the environment.

The truly "encapsulated" agent or enzyme of claims 2, 21-30, 101, 102 and new claims 107, 118 can be produced to survive prolonged exposures to initial or normal conditions of fluid use (*e.g.*, conventional or normal drilling conditions) with no appreciable release of the enzyme. It is only upon the receipt of a trigger condition not found during the initial conditions of use of the fluid that the enzyme is released. Likewise in claims 1, 40, 44 and 49 and new claims 103-106 and 108-129 the sequestered agent is initially inactive and subsequently activated by a triggering signal other than temperature or pressure of mechanically closing formation fractures or osmotic pressure. For example, the trigger can be pressure change due to reversing the positive pressure differential between the well bore and the surrounding formations, which allows previously excluded formation fluids to contact the encapsulated enzymes contained within a filter cake. Another example of a preferred trigger is a chemical, such as a dilute solution of citric acid, introduced into

the well bore to effect a change in pH by diffusion of hydrogen ions into the filter cake containing the sequestered agent (claim 102). New claim 109 is specifically drawn to an embodiment wherein the triggering signal is the reversal of pressure differentials in a downhole situation. Support for this claim is found in Applicants' specification at page 16, lines 28-29, for instance. None of those triggering signals are taught or suggested by the *Gupta et al.* reference.

Moreover, diffusion and volatilization, as discussed in the *Gupta et al.* reference (see col. 5, line 20 of *Gupta et al.*), are not the same thing as the claimed triggering signals or stimuli of claims 1, 40, 44, 46 and 49. According to WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY, Philip Babcock Gove, Ed., Springfield, MA (2002), "diffusion" is defined as:

...the process whereby particles (as molecules and ions) of liquids, gases or solids intermingle as the result of their spontaneous movement caused by thermal agitation and in dissolved substances move from a region of higher concentration to one of lower concentration."

The diffusion process itself could not be a triggering signal (as set forth in claims 1, 3, 22, 40, 44, 46 and 49) that initiates the release or activation of an agent such as an inactivated enzyme. Instead, the diffusion process appears to be a natural occurrence due to the physical properties (e.g., porosity) of the encapsulation material and the nature of the surrounding medium.

Similarly, volatilization itself is not a triggering signal. Rather, it is a natural result of exposure to a temperature high enough to cause the encapsulating material to volatilize. At col. 3, lines 48-52, *Gupta et al.* state:

The technology involves creating a matrix of pores containing the active ingredient and controlling the release based on diffusion or the expansion of the pores at given temperatures to release the active ingredients.

Applicants claims 1, 40, 44, 46 and 49, as amended, expressly exclude change in temperature or change in pressure (other than mechanically crushing by closing formations or osmotic pressure) as the claimed triggering signals. As claimed in dependent claims 19, 104, 108, 113, 114, 116, 117 and 125-127, however, a change in pressure or temperature may be used in addition to one or more of the triggering signals recited in claim 3. Claim 3 has been rewritten in independent form and now includes all of the limitations of amended claim 1. Claims 1, 3, 21, 22 and 40 have been amended to clarify the language, those claims now reciting "initially" or "initial conditions" rather than "normal conditions," which is considered by the Examiner to be

insufficiently defined so as to distinguish it from the prior art. Claims 19, 21, 31, 32, 34, 44, 49, 86, 87 and 93 have also been amended for better consistency and clarity.

Applicants believe that independent claims 1, 3, 40, 44, 46 and 49 as well as the dependent claims 2, 19-21, 31, 32, 34-37, 39, 43, 86-90 and 93-98 which variously depend directly or indirectly therefrom, distinguish over the teachings of *Gupta et al.* In particular, *Gupta et al.* do not teach the claimed triggering signals (i.e., triggering signals other than change in temperature or change in pressure other than mechanically crushing by closing formations or osmotic pressure). It is not Applicants' intention, however, to disclaim any enhancing, inhibitory or other modulating or supplementary effects due to any pressure or temperature changes that may coincidentally occur when the claimed methods are practiced with the claimed triggering signals in claims 1, 40, 44, 46 and 49. For example, under certain circumstances, elevated temperature or increased pressure encountered during drilling activity might accelerate or retard the pH-change triggered enzyme release or the activated enzyme's level of activity in a downhole environment. Likewise, Applicants also do not disclaim any diffusion process or volatilization that may take place in addition to the triggering signals of claims 1, 40, 44, 46 or 49. For instance, the physical mechanism by which enzyme molecules move across a pH-altered membrane may comprise diffusion. It is also possible that a volatilization process may, to some degree, speed the release of enzyme into the surrounding fluid, in some instances of use. Such effects of temperature, pressure, diffusion or volatilization would be strictly secondary to the selected triggering signal in practicing the method of any of Applicants' claims 1-3, 19-21, 31, 32, 34-37, 39, 40, 43, 44, 46, 49, 86-90 and 93-98.

With respect to claim 46, Applicants respectfully traverse the Examiner's suggestion that "the polymer becomes a contaminant prior to cleanup." The Examiner's interpretation is not consistent with the description in this claim. In the first line of claim 46, Applicants state that the "contaminant arises from a subterranean formation." In the present case, it is clear that this phrase in the claim's preamble gives life and meaning to the term "contaminant" as used subsequently in the body of claim 46. By contrast, a polymer-type "contaminant" introduced downhole via a drilling fluid, for example, would not originate or arise from a subterranean formation.

With respect to claim 3, as originally drafted and as now rewritten in independent form, the specific triggering signals recited in the Markush group are not taught by *Gupta et al.* Clearly, claim 3 is not anticipated by *Gupta et al.*

Rejection Under 35 USC § 103(a)

In the Office Action, claims 1, 20, 21 and 33 are viewed by the Examiner as being unpatentable under 35 USC § 103(a) over *Gupta et al.* In reply, Applicants respectfully traverse at least for the same reasons as discussed above with respect to the rejection of claim 1 under 35 USC § 102(b). As amended, claim 1, and claims 20, 21 and 33 which depend directly or indirectly therefrom, expressly exclude temperature and pressure changes as the triggering signal and include triggering signals that are not taught or suggested by *Gupta et al.* Any temperature and/or pressure changes that might occur during practice of the claimed method would not serve as a triggering signal as defined in the claims, and are not disclaimed. For example, in the method described in allowable claim 91, the pH change is the triggering signal and pressure reduction is a secondary or facilitating factor.

With respect to claims 20, 21 and 33, even if an encapsulated enzyme taught by *Gupta et al.* were used for degrading a polymer by the delayed release techniques taught by *Gupta et al.* (at col. 3, lines 48-52 or col. 5, lines 15-20, for example), it still would not constitute a teaching or suggestion of the triggering means of claims 20 and 21, which expressly exclude changes in temperature or pressure. For at least these reasons, claims 1, 20, 21 and 33, as amended, are believed by Applicants to be non-obvious over the cited reference.

Objection to the Claims

Applicants gratefully acknowledge the Examiner's indication that claims 4-17, 22-27, 30, 41, 42, 45, 47, 48, 91, 92, 99-101 and 103 are allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 4-17 have been amended such that they depend from now-independent claim 3 instead of claim 1. Claim 22 has been amended to depend from claim 2 instead of claim 21. Applicants believe that claim 2, which depends from amended claim 1, and claims 22-27 and 30 which depend directly or indirectly from claim 2, are all allowable. Claims 41, 42, 45, 47, 48, 91, 92, 99-101 and 103 variously depend directly or indirectly from amended claims 1, 40, 44 or 46, which are believed to be allowable.

Other Amendments

Claims 1 and 3 have been amended to require that the degradable polymer is used for hydrocarbon exploitation. Applicants reserve the right to file a continuing application include

claims that go beyond hydrocarbon exploitation. Claims 19, 21, 31, 32, 34, 44, 49, 86, 87 and 93 have been amended for better consistency and clarity. Claims 24 and 42 have been amended to correct typographical or clerical errors. The dependency of claims 31-34 has been changed from claim 21 to claim 20. Without changing their scope, claims 40 and 41 have been amended for clarity and, where applicable, to omit redundancy. Independent claim 44 has been additionally amended for clarity, replacing "reactivated" with "activated." Claims 30 and 41 have been amended similarly. Allowed claim 102 has been amended to correct an error in lines 6 and 7 in which "impermeable" and "permeable" were switched. As corrected, lines 6 and 7 are now consistent with the last three lines of the claim with respect to "first permeability" and "second permeability." Claim 103 has been amended to change the dependency from claim 44 to claim 49. It is believed that the allowance of claim 102 and the allowability of claim 103 is unaffected by these changes. New dependent claims 104-129 are drawn to specific embodiments to which Applicants are entitled, and are properly included with the elected claims of Restriction Group I.

CONCLUSION

Applicant may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other distinctions between the claims and the prior art, which have yet to be raised, but which may be raised in the future.

Applicant believes that all claims are patentably distinct from the prior art and respectfully request reconsideration of the rejections and allowance of all pending claims. No new subject matter has been introduced by way of any of the amendments made herein. In the event that an extension of time is necessary in order for this submission to be considered timely filed, please consider this a request therefor, and the Commissioner is authorized to charge the fee to Deposit Account 03-2769 of Conley Rose, P.C., Houston, Texas. If the Examiner believes that a telephonic interview would be beneficial, the Examiner is invited to contact the undersigned at the number listed below.

Respectfully submitted:

Carol G. Mintz

Carol G. Mintz
Reg. No. 38,561
Conley Rose, P.C.
P. O. Box 3267
Houston, Texas 77253-3267
(713) 238-8000
AGENT FOR APPLICANTS

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